

## CHAPTER 8

### GAS CHLORINATION

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#### 8-1. GENERAL.

Gas chlorination of swimming pools is accomplished by dissolving chlorine gas in a flowing stream of water and then injecting this stream into the recirculation system. The gas and water are mixed in a chlorinating device that is adjustable to control the feed rate, which is usually scaled in terms of pounds per 24 hours. Thus, a 50-pound chlorinator is capable of feeding 50 pounds of chlorine per day; a 100-pound chlorinator is capable of feeding 100 pounds per day, etc.

#### 8-2. SIZING EQUIPMENT.

The size of a chlorinator needed for any given pool is determined by the size of the pool in total gallons or gallons per minute (gal/mm) of the recirculation system. One common sizing formula accepted by most designers is to divide the gal/mm of the system by eight with the quotient expressing the pounds per day needed. Thus, a pool that is recirculated at 800 gal/mm requires a 100-pound chlorinator. This formula appears to size a machine at three to four times the average capacity needed daily; however, what appears to be oversizing is actually a safety precaution because of the hazards involved in high volume chlorine feeding from a single tank through a single chlorinating device.

#### 8-3. FEED RATE.

The actual feed rate for proper chlorination of a pool cannot be predicted by any standard formula. As noted in earlier discussions of the disinfection mechanism, the chlorine demand of the pool is determined by the quantity of bacteria and dirt, the size of the bathing load, the temperature, and many other factors. As these contaminating influences fluctuate, the rate of chlorination must be adjusted accordingly. The experienced pool operator soon learns “approximate settings” for proper chlorination under these varying conditions, based on trial-and-error adjustments determined by test kit readings of the pool water. Gas chlorination equipment operator training stresses safe handling of chlorine cylinders, connecting and disconnecting the chlorinators, and emergency procedures. (See figure 8.1.)

#### 8-4. pH EFFECT.

The chlorine feed rate has a corresponding influence upon pH, so it is equally important for the operator to adjust the chemical feeding devices for pH control. Be-

cause gas chlorination lowers pH, the feeding of soda ash alkalizing agent must be increased when chlorine feed is increased and vice versa. Even so, the required feed rates are not precisely proportional; therefore, the alkaline feed rate must be determined by reading the pH of the water in the pool.

#### 8-5. GAS CYLINDERS.

a. All containers used to transport liquified chlorine gas are Department of Transportation steel cylinders. Chlorine cylinders for pools are of seamless steel construction with an operating valve equipped with a safety device, a fusible metal plug. This plug is designed to melt at 1580 F to permit escape of chlorine gas as an alternative to tank rupture. The fusible plug should not be tampered with under any circumstances.

b. The operating valve has a nonstandard pipe thread requiring a special wrench. The special wrench is intended to signal “danger” and to discourage the use of pliers, wrenches, or a hammer to force connections. The standard handling technique must be used.

#### 8-6. CONNECTING CYLINDERS.

a. When connecting a cylinder to a chlorinator, special precautions should be taken to insure that the connections are secured before the operating valve is opened. After the valve has been opened, the connection should be tested for leaks that are too small to be detected by odor or by the sound of escaping gas. This is accomplished by holding an uncapped bottle of ammonia near all connections. Even the smallest leaks of chlorine gas will become immediately apparent as a chemical reaction between the chlorine and ammonia produces a white vapor cloud of ammonium chloride.

b. When a cylinder is empty the valve should be closed and tested for leaks, and the valve hood replaced. The empty tank should then be treated and handled as though full until it is removed from the premises.

#### 8-7. CYLINDER LOCATION.

Chlorine cylinders and equipment should be located in fire-resistant, separate and enclosed indoor areas, accessible only to authorized persons. Such areas should be clean, well lighted, dry, and well ventilated, and should have at least two means of access and exit. One or more chlorine gas masks should always be on hand outside the storage room. Cylinders should be stored

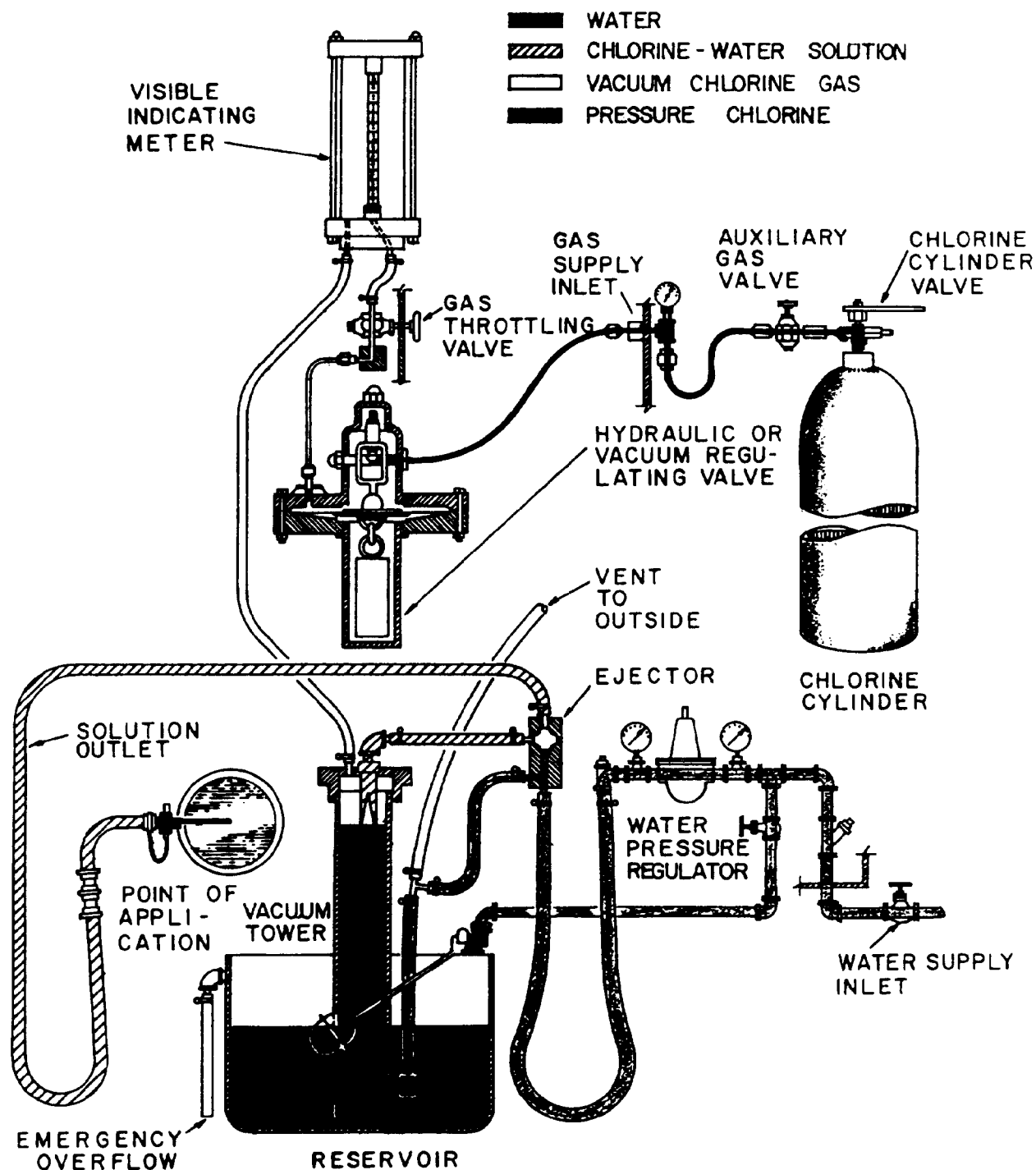


Figure 8-1. Flow diagram of manually controlled vacuum chlorinator

securely fastened in an upright position to prevent tipping or falling and in a location that avoids the possibility of being struck by heavy objects.

#### 8-8. HANDLING AND STORING GAS CYLINDERS.

Cylinders should be moved on a properly balanced hand truck having a cradle or clamp support near the

top of the tank. The cylinder should not be lifted or rolled by its protection hood. Chlorine gas cylinders should never be stored or handled near heat pipes or other external sources of heat. At room temperature a full chlorine cylinder contains approximately 90 percent liquid and 10 percent gas. As temperatures increase the resulting internal pressures increase the percentage of liquid and reduce the percentage of gas.

At approximately 154° F the container is completely filled with liquid. A further increase in temperature will cause the fusible plug to melt, permitting a rapid escape of the tank contents.

#### **8-9. EMERGENCY PREPAREDNESS.**

Safety in handling gas chlorine depends upon the effectiveness of employee training, proper safety instruction, intelligent supervision and the use of safe equipment. Employees should be thoroughly informed of the hazards of improper handling.

#### **8-10. LEAK PROCEDURE.**

Only authorized trained personnel, equipped with suit-

able gas mask, should investigate a chlorine leak. All other persons should be cleared from the area immediately and kept away until the leak is corrected. If the leak cannot be corrected promptly, the nearest office of any chlorine supplier or producer should be called immediately for assistance.

#### **8-11. FIRST AID.**

Any person overcome by or seriously exposed to chlorine should be moved at once to an uncontaminated area, and should be kept completely at rest and warm until medical assistance can be obtained. If breathing ceases, immediately apply artificial respiration or use approved inhalation equipment or oxygen.